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Near-field Acoustic Holography for partial measurements inside complex structures

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Near-field acoustical holography (NAH) requires the measurement of the near-field pressure field over a closed surface in order to recover the acoustic field on a nearby conformal surface. Very often we encounter applications where pressure measurements are available only over a patch of the measurement surface. In these cases the strict NAH theory does not hold, but still there are techniques that have been developed to overcome this difficulty. The best-known technique for planar surfaces is patch NAH and, recently proposed, for arbitrarily shaped surfaces patch IBEM and patch ESM. It was found in a recent study by the authors that these techniques will be affected by the problem of back-source contamination for interior NAH, but it was showed that this problem could be overcome by the use of "Cauchy" measurements. In this work we will compare the reconstruction of the acoustic field from patch based techniques with the technique that uses Cauchy measurements, and discuss the problem of back-source contamination in more detail. We use a cylindrical surface excited by a point force as an example to validate our results. This work was supported by the US Office of Naval Research.